

MILITARY SPECIFICATION SHEET

ELECTRON TUBE, KLYSTRON

TYPE 6116

The complete requirements for procuring the electron tube described herein shall consist of this document and the latest issue of Specification MIL-E-1.

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

DESCRIPTION: CW, reflex oscillator, integral cavity, thermally tuned, frequency range 8,500 to 9,660 MHz

ABSOLUTE RATINGS:

Parameter:	E _f	E _{rs}	E _r	P _p	I _{k1}	E _{hk1}	E _b	Alt
Unit:	V	V _{dce}	V _{dce}	W	mAdc	V _{dce}	V _{dce}	ft
Maximum:	6.8	350	-350	16.5	32	±100	350	10,000
Minimum:	5.8	---	---	---	---	---	---	---
(see note 5)				(see notes 1 and 5)	(see note 5)	(see note 5)	(see note 5)	

PHYSICAL CHARACTERISTICS:

Dimensions: See figure 1

Cathode: Unipotential

Mounting: See note 2

TEST CONDITIONS:

E _{f1}	E _{f2}	E _{rs}	E _r	E _b
V	V	V _{dce}	V _{dce}	V _{dce}
6.3	6.3	300	-60 to -175	0 to 280

Frequency		
F	MHz	J
F1	8,500	0.3%
F2	9,080	0.3%
F3	9,660	0.3%

GENERAL:

Qualification - Required

METHOD	REQUIREMENT OR TEST	NOTES	CONDITIONS	SYMBOL	LIMITS		UNIT
					MINIMUM	MAXIMUM	
	<u>Quality conformance inspection, part 1</u>	6					
1256	Electrode current (cathode 1)	5	$E_r = -150$ Vdc	I_{k1}	---	32	mAdc
4250	Power output	5, 7	$E_{II} = 5.8$ V; $F = F_1$ to F_3	P_o	20	---	mW
4213	Reflector voltage	7	$F = F_3$	E_r	-95	-145	Vdc
4214	Cathode emission	---					
	Cathode 1	5	$E_{II} = 6.3$ to 5.8 V; $t = 120$ sec; $E_r = -150$ Vdc	$\Delta I_{k1}/I_{k1}$	---	15	%
	Cathode 2	5	$E_{II} = 6.3$ to 5.8 V; $t = 120$ sec; $I_{k2} = 20$ mAdc	$\Delta I_{k2}/I_{k2}$	---	10	%
4229	Total reflector current	---	$E_r = -150$ Vdc; $t = 120$ sec (min)	I_r	---	5.0	μ Adc
4229	Reflector-leakage current	3	$E_r = -150$ Vdc	I_r	---	5.0	μ Adc
4229	Reflector-gas current	---	$E_r = -150$ Vdc	I_r	---	2.0	μ Adc
---	Thermal tuning time	---					
	Tuning time 1	4	$F = F_3$ to F_1	t	0.7	3.0	sec
	Tuning time 2	4	$F = F_1$ to F_3	t	0.7	3.0	sec
	<u>Quality conformance inspection, part 2</u>						
1301	Heater current 1	5		I_{H1}	465	570	mA
1301	Heater current 2	5		I_{H2}	720	880	mA
1211	Insulation of electrodes	---	$E_{rs} = 300$ Vdc; tube cold	R_{k1-rs} R_{k2-rs} R_{h1-rs}	2.0 2.0 2.0	---	Meg
1336	Heater-cathode leakage	---	$E_{hk1} = +100$ Vdc	I_{hk1}	---	100	μ Adc
1031	High-frequency vibration	7	$F = F_2$	ΔF	---	+1,300	kHz
---	Electronic tuning range	---	E_r (mode A)/50% max P_o ; $F = F_1$ to F_3	ΔF	45	---	MHz
---	Thermal tuning range	5, 7	$E_{II} = 5.8$ V; $P_p = 1.0$ to 9.0 W High frequency Low frequency	F F	9,660 ---	---	MHz
---	Tuner diode voltage drop	---	$I_{k2} = 10$ mAdc $I_{k2} = 28$ mAdc	E_b E_b	170 225	218 274	Vdc
---	Tuner diode voltage	7	$F = F_3$ $F = F_2$ $F = F_1$	E_b E_b E_b	170 200 220	230 260 275	Vdc

METHOD	REQUIREMENT OR TEST	NOTES	CONDITIONS	SYMBOL	LIMITS		UNIT
					MINIMUM	MAXIMUM	
	<u>Quality conformance inspection, part 2</u> -Continued						
---	Tuner diode current	7	F = F3 F = F2 F = F1	Ik2	5	19	mAdc
---				Ik2	13	28	mAdc
---				Ik2	20	36	mAdc
	<u>Quality conformance inspection, part 3</u>						
---	Life-test provisions	7	Group C; Ik2 = 20 mAdc	I	500	---	hrs
---	Life-test end points:	---					
4250	Power output	5, 7	EII = 5.8 V; F = F1 to F3	Po	10	---	mW
---	Thermal tuning range	7	EII = 5.8 V, Pp = 0.5 to 9.5 W High frequency Low frequency	F	9, 660	---	MHz
				F	---	8, 500	MHz

NOTES:

1. Power inputs as high as 16.5 watts may be applied to the diode when the frequency of the klystron is above 8,500 MHz. Tuner power in excess of 10 watts may permanently damage the tuning structure if applied when the tube is tuned below 8,500 MHz.
2. The tube shall be fixed firmly in a suitable socket by clamps which make contact with the tube at the base and adjacent platform only. The measurements on the tube in an oscillating state shall be made with the output lead coupled into a waveguide tube mount section per Drawing 227-1AN, or equivalent. Measurements taken with the tube oscillating shall be done with a matched load. (VSWR = 1.15:1 maximum.)
3. The cathode lead to be opened shall be cathode 1 in accordance with method 4229.
4. The thermal tuning speed shall be measured in the following manner: The tuner diode voltage and reflector voltage shall be mutually adjusted to produce maximum power under stable conditions of the initial frequency indicated for thermal tuning time 1 or thermal tuning time 2. The tuner diode voltage and reflector voltage shall then be switched simultaneously to the end condition values indicated in the table. The time interval between the instant of switching and the time at which the tube delivers maximum output at the end frequency of the test shall not exceed the specified value.

NOTES: -Continued

Test	Condition	E _b and E _r conditions	F
Thermal tuning time 1	Initial	Mutually adjusted for max P _o in Mode A at initial frequency	9,660 MHz ± 0.3%
	End	E _b = 280 Vdc; E _r (Mode A)/max P _o at 8,500 MHz	8,500 MHz ± 0.3%
<u>1/</u> The diode plate potential E _b shall not be held at 280 volts for longer than 2 seconds after the end frequency (8,500 MHz) has been reached.			
Thermal tuning time 2	Initial	Mutually adjusted for max P _o in Mode A at initial frequency	8,500 MHz ± 0.3%
	End	E _b = 0; E _r (Mode A)/max P _o at 9,660 MHz	9,660 MHz ± 0.3%

5. Cathode 1, E_{f1}, and heater current 1 refer to parts associated with the radio frequency section of the tube. Cathode 2, E_{f2}, and heater current 2 refer to parts associated with the thermal tuner diode section of the tube. Symbol P_p refers to power dissipation in the thermal tuner anode. Symbol E_b refers to the plate potential of the thermal tuner diode.
6. Unless otherwise specified, the AQL for all tests listed under quality conformance inspection, part 1, shall be 1.0 percent, with inspection level II.
7. E_r (mode A) max P_o.

Custodians:

Army - EL

Navy - EC

Air Force - 80

Preparing activity: Navy - EC

Agent: DSA - ES

(Project 5960-2425-38)

Review activities:

Army - MU

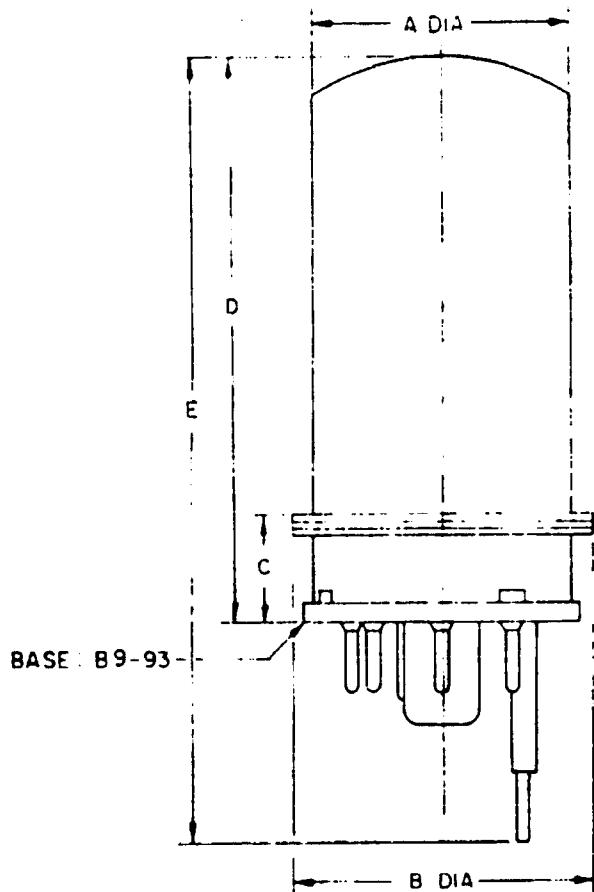
Air Force - 11, 17

DSA - ES

User activities:

Army - WC

Navy - AS, OS, CG, SH



1.tr	Dimensions in inches with metric equivalents (mm) in parentheses	
	Minimum	Maximum
Quality conformance inspection, Part 1 (See note 6)		
A	—	1.281 (32.54)
B	1.500 (38.10)	1.625 (41.28)
C	.375 (9.53)	.437 (11.10)
D	—	2.562 (65.07)
E	—	3.796 (96.42)

BASE CONNECTIONS	
PIN NO.	ELEMENT
1	Tuner heater
2	Tuner heater-k
3	rs and sh
4	Output
5	Gun-k
6	Heater (I)
7	Heater (I)
8	Reflector

FIGURE 1. Outline drawing of electron tube type 6116.